

# 2SK3567

## Switching Regulator Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 1.7 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 2.5S$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu A$  ( $V_{DS} = 600 V$ )
- Enhancement mode:  $V_{th} = 2.0 \sim 4.0 V$  ( $V_{DS} = 10 V$ ,  $I_D = 1 mA$ )

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	600	V
Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )		$V_{DGR}$	600	V
Gate-source voltage		$V_{GSS}$	$\pm 30$	V
Drain current	DC (Note 1)	$I_D$	3.5	A
	Pulse ( $t = 1\text{ ms}$ ) (Note 1)	$I_{DP}$	14	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	35	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	201	mJ
Avalanche current		$I_{AR}$	3.5	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	3.5	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~150	$^\circ\text{C}$

**Note:** Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

## Thermal Characteristics

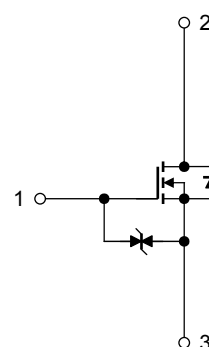
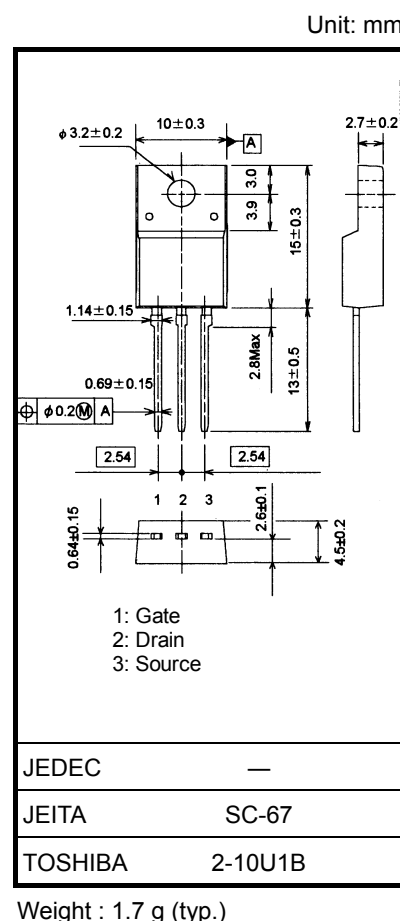
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	3.57	°C/W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

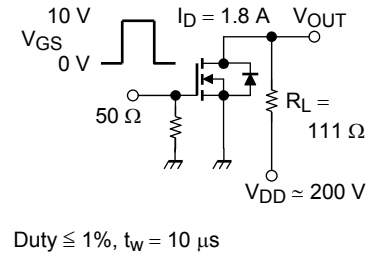
Note 2:  $V_{DD} = 90\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}(\text{initial})$ ,  $L = 28.8\text{ mH}$ ,  $I_{AR} = 3.5\text{ A}$ ,  $R_G = 25\ \Omega$

Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device. Please handle with caution.



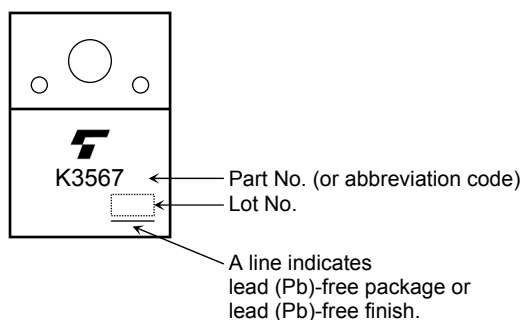
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-source breakdown voltage		$V_{(BR) GSS}$	$I_G = \pm 10 \mu\text{A}, V_{DS} = 0 \text{ V}$	$\pm 30$	—	—	V
Drain cut-off current		$I_{DSS}$	$V_{DS} = 600 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	600	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	2.0	—	4.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 1.8 \text{ A}$	—	1.7	2.2	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 1.8 \text{ A}$	0.7	2.5	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	550	—	pF
Reverse transfer capacitance		$C_{rss}$		—	6	—	
Output capacitance		$C_{oss}$		—	60	—	
Switching time	Rise time	$t_r$		—	12	—	ns
	Turn-on time	$t_{on}$		—	45	—	
	Fall time	$t_f$		—	13	—	
	Turn-off time	$t_{off}$		—	80	—	
Total gate charge		$Q_g$	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 3.5 \text{ A}$	—	16	—	nC
Gate-source charge		$Q_{gs}$		—	10	—	
Gate-drain charge		$Q_{gd}$		—	6	—	

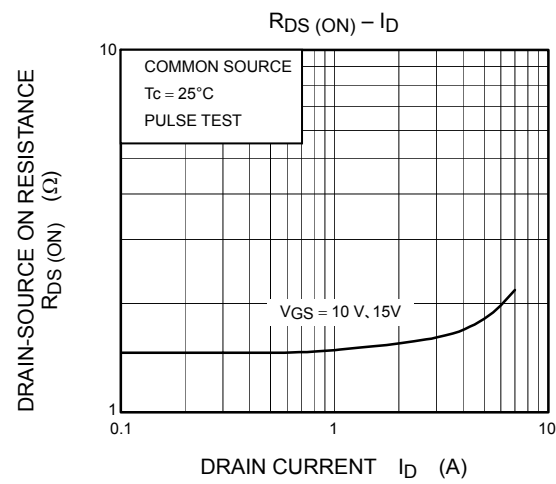
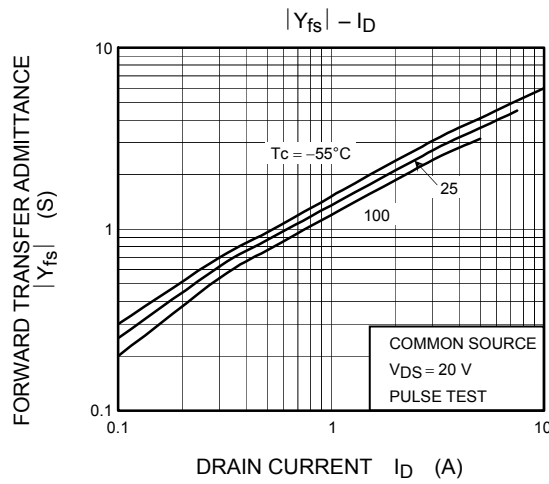
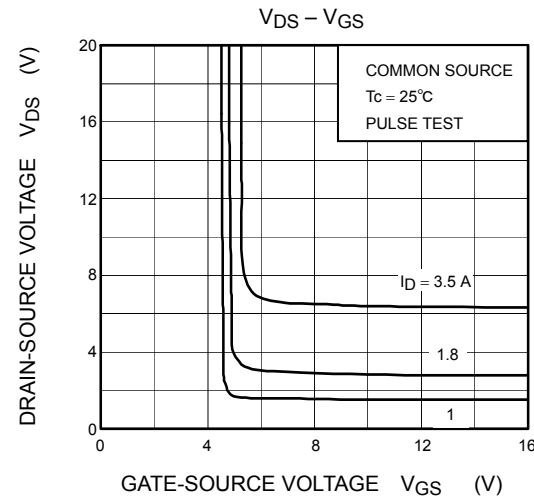
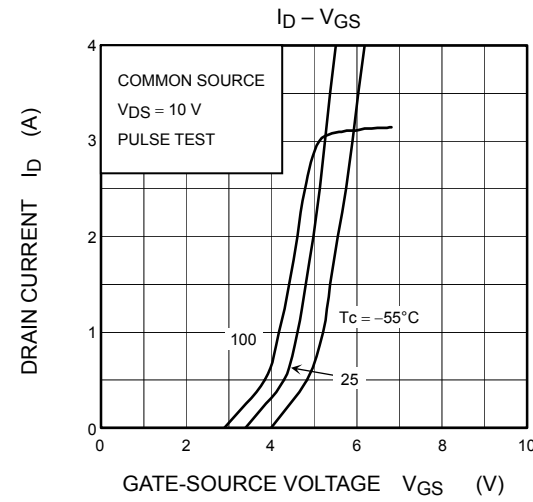
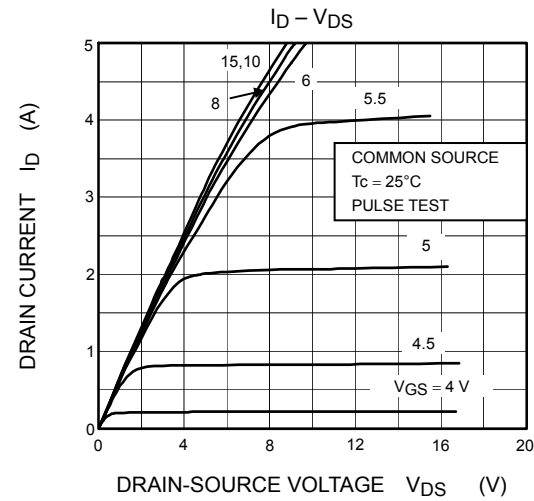
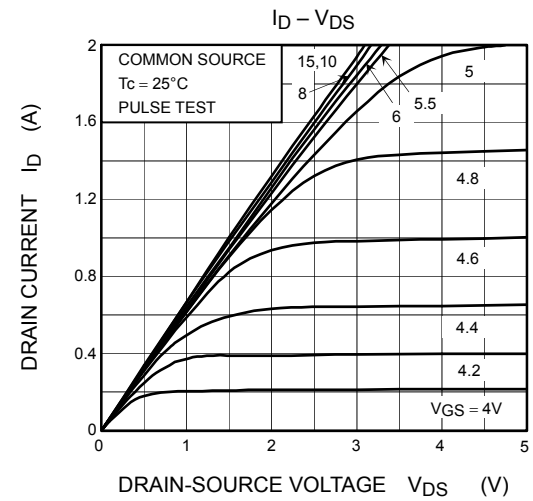
Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	3.5	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	14	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 3.5 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 3.5 \text{ A}, V_{GS} = 0 \text{ V},$	—	1400	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	9.0	—	$\mu\text{C}$

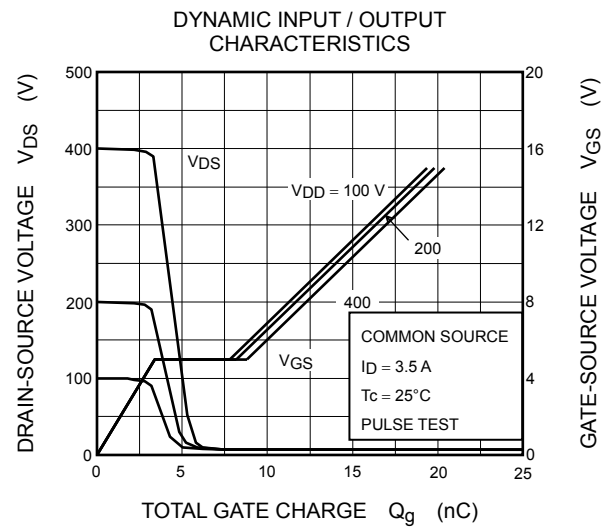
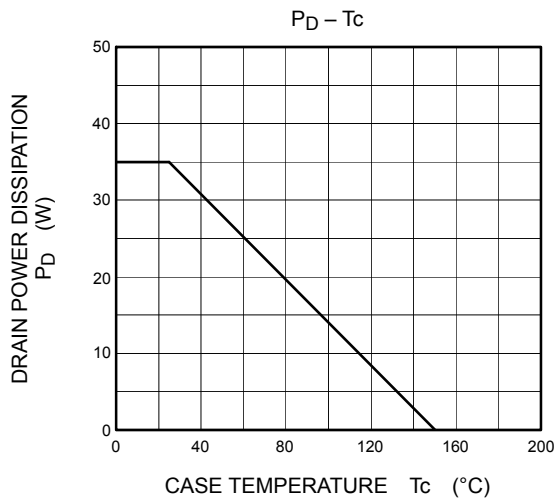
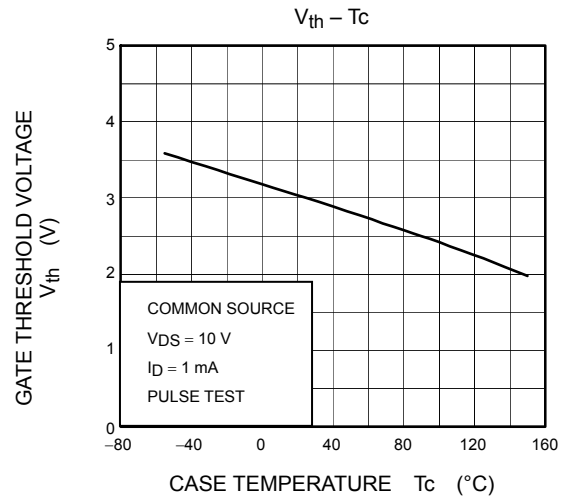
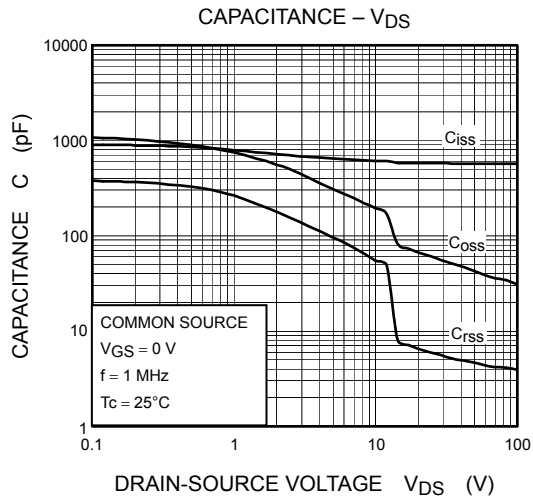
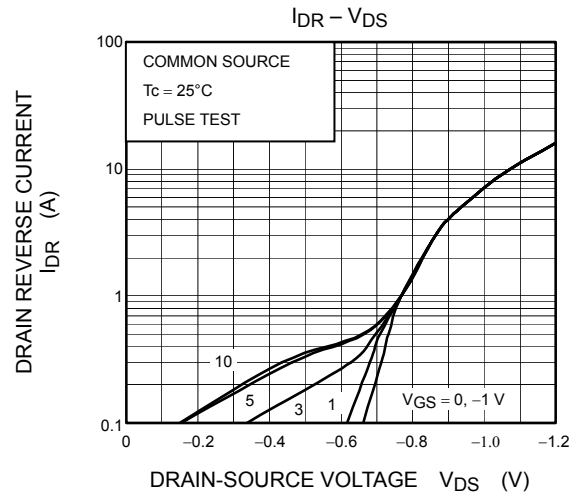
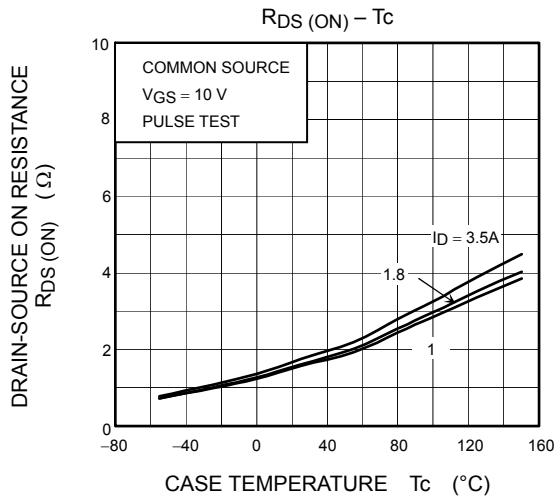
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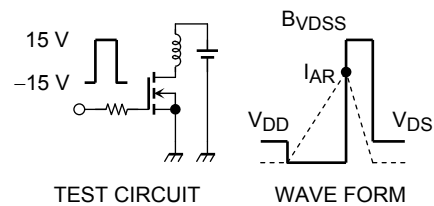
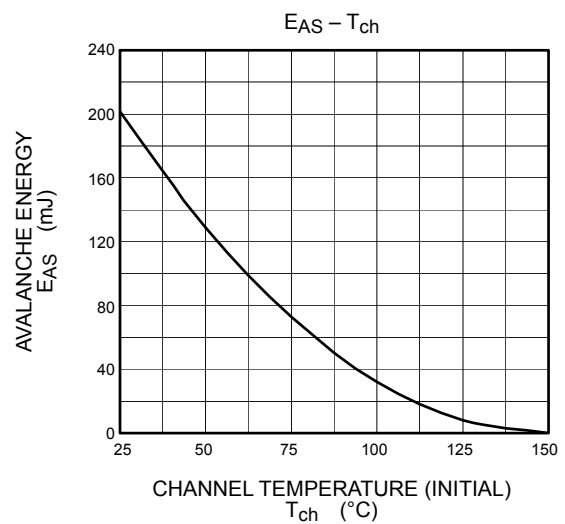
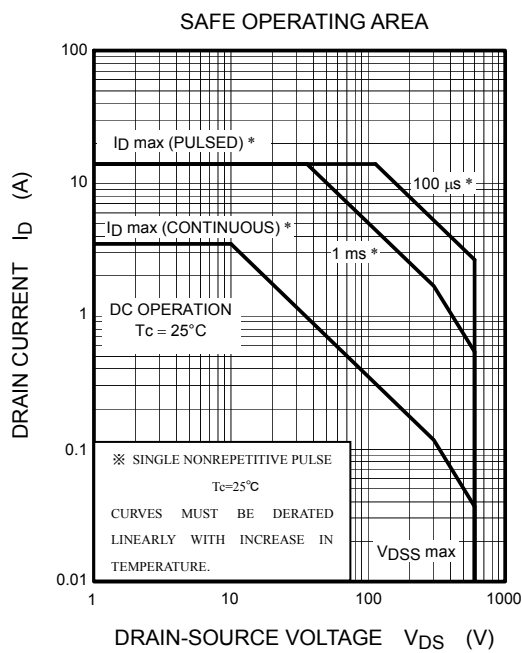
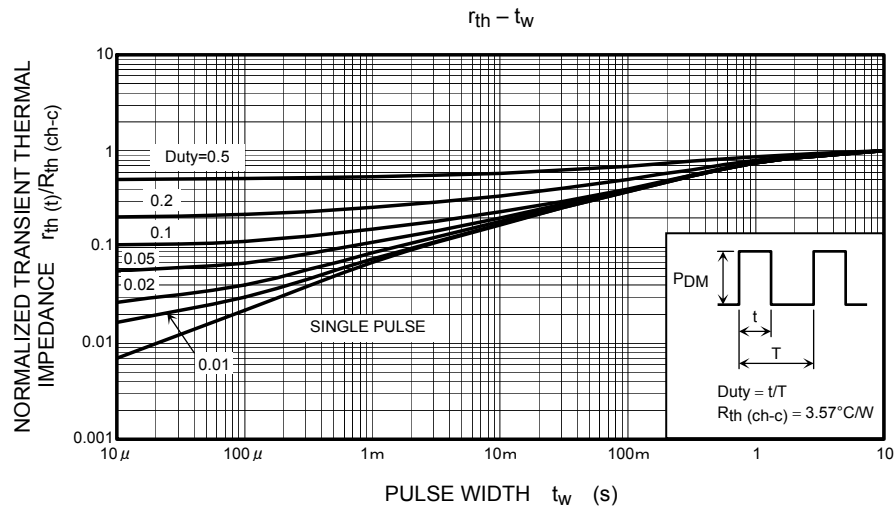
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$$R_G = 25 \, \Omega$$

$$V_{DD} = 90 \, V, L = 28.8 \, mH$$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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